

**Japanese (PDF)****File Wrapper Information**

**FULL CONTENTS CLAIM + DETAILED DESCRIPTION  
TECHNICAL FIELD PRIOR ART EFFECT OF THE  
INVENTION TECHNICAL PROBLEM MEANS  
DESCRIPTION OF DRAWINGS DRAWINGS**

[Translation done.]

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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

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**CLAIMS**

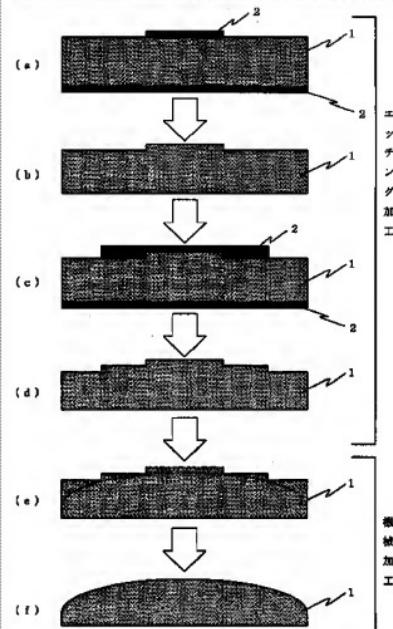
**[Claim(s)]**

[Claim 1] The convex processing method of the small piezoelectricity matter plate characterized by giving a chemical etching process before convex processing in the convex processing method of the small piezo-electricity matter plate which constitutes a piezoelectric vibrator.

[Claim 2] This chemical etching process according to claim 1 is the convex processing method of the small piezoelectricity matter plate characterized by making [ in each piezo-electric matter plate unit ] thickness thin according to the perimeter part of this \*\*\*\* from the central part of a piezo-electric matter plate according to the heavy etching step which stepped on the phase for this piezo-electric

**Drawing selection**

**Representative draw**



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matter plate that carries out outside finishing.

[Claim 3] The convex processing method of the small piezoelectricity matter plate according to claim 1 or 2 characterized by the configuration of said piezo-electric matter plate being a PURANO convex or a by convex.

## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] It is related with the convex machining efficiency betterment of piezo-electric raw materials, such as a crystal oscillator.

[0002]

[Description of the Prior Art] Conventionally, since frequency accuracy is excellent, many Takayasu constant piezo oscillators (the frequency stability especially over a surrounding temperature change and a surrounding secular change is high) in a field broad from an instrumentation to base stations, such as a cellular phone, are used. Takayasu -- a law -- a quartz oscillator -- general -- Takayasu -- a law -- [ it is making it the container form which designed the trembler to quartz oscillators, held into the small constant temperature bath including the trembler as an oscillating circuit, and covered the whole with metal casing, and ] For example in [ temperature ] -10 degrees C - +60 degrees C, constancy is 10-8 to  $5 \times 10^{-9}$ , and, as for the frequency temperature characteristics, as for the ageing characteristic, about \*\*2xten to eight thing is demanded at every year.

[0003] Thus, the trembler which fulfills very high frequency stability and an ageing characteristic is asked for that frequency temperature characteristics are good, being a variation per hour (ageing characteristic), the crystal impedance being very small, etc. throughout the category temperature range.

[0004] [ the trembler which fulfills the conditions for which the above tremblers are asked ] Unlike the usual trembler, the 3rd higher-harmonic-wave mode [ 5th ] is used. It is common that the device of considering it as the by convex configuration where made one principal plane of the piezo-electric matter plate into the PURANO convex configuration where the field of another side was processed planate, the shape of a convex, or both principal planes were processed in the shape of a convex, adhering a golden electrode film in an elevated temperature, and making film

distortion small is given. The necessity for this convex processing is processing the principal plane of a trembler in the shape of a convex, confines vibrational energy in the center section of the piezo-electric matter plate (trembler), and has the aim which makes oscillating loss by support small.

[0005]

[Problem to be solved by the invention] The high stable crystal oscillator needs to keep many characteristics of the trembler itself high-definition as mentioned above, and it is necessary to process the principal plane of a trembler into specification reservation of the quality maintenance and trembler in the shape of a convex conventionally. When maintaining many characteristics of a trembler -- the thickness of a trembler becomes thick -- convex-like processing is mentioned as indispensable processing conditions, as the center frequency ( $f_0$ ) of the trembler itself turns into a low frequency especially.

[0006] However, the processing unit price of the actual condition of a piezo-electric matter plate -- with the frequency of a trembler, an outside dimension and the thickness of convex-like processing are also various, and it needs the floor to floor time of the convex-like processing [ itself ] -- is very high. Moreover, in order to process a piezo-electric matter plate to the last convex configuration and to perform mechanical convex processing, technical problems in a manufacturing process, such as polishing quantity (processing distortion of pretreatment is removed), processing distortion, and breakage (KAKE, HIKI, crack) of a piezo-electric matter plate, etc. are mentioned.

[0007]

[Means for solving problem] In order to solve the technical problem mentioned above, this invention is the convex processing method of the small piezo-electricity matter plate characterized by giving a chemical etching process before convex processing in the convex processing method of the small piezo-electricity matter plate which constitutes a piezoelectric vibrator. [ the convex processing method in this invention / this piezo-electric matter plate that carries out outside finishing in each piezo-electric matter plate unit ] After making thickness thin according to the perimeter part of this \*\*\*\* from the central part of a piezo-electric matter plate by heavy etching, the principal plane of a piezo-electric matter plate is processed into a convex configuration for a piezo-electric matter plate with a PURANO convex

(one side) or a by convex (both sides).

[0008] [ a place which is greatly different from the convex processing procedure of the conventional piezo-electric matter plate in short ] Perform an etching step also before convex processing and actually (1) After deleting the corner of a piezo-electric matter plate for the piezo-electric matter plate in each piezo-electric matter plate unit which carries out outside finishing by (2) heavy etching, (3) Shorten the time which adds the process which processes convex processing by (4) etching beforehand to a piezo-electric matter plate, and it takes at the convex processing of a piezo-electric matter plate itself at machining by convex processing.

[0009]

[The form of operation of this invention] According to an accompanying drawing, the work example of this invention is explained hereafter. In addition, in each drawing, the same code shall show the same object. Drawing 1 explains an example of convex processing made into one work example of the invention in this application. Drawing 1 (a) - drawing 1 (f) show change of the configuration of the piezo-electric matter plate 1 of convex processing of this invention. Turn is explained to drawing 1 for signs that etching performs convex processing, later on.

[0010] In drawing 1 (a), all over piezo-electric matter plate 1, evaporation or an overcoat 2 is applied and heat desiccation of the overcoat 2 (for example, Cr, nickel, Au) is carried out. Thereby, an etching pattern can be formed on the piezo-electric matter plate 1. And it dips in an etching solution (fluoric acid system), and etching processing is carried out, and if an overcoat 2 is exfoliated next, processing disposal will be made like drawing 1 (b).

[0011] Drawing 1 (c) and drawing 1 (d) repeat above-mentioned drawing 1 (a) drawing 1 and the same process as (b), and make thickness thin toward the perimeter part of the 1st page of a piezo-electric matter plate gradually. And it finish-machines so that a final convex configuration may be acquired by the conventional processing method. Drawing 1 (e) shows signs that a grinder performs convex processing. Polishing work can be performed so that it may become convex processing like a drawing midpoint line, and drawing 1 (f) can be obtained as final shape. Although etching processing is performed with two steps of overcoat

2 applications with an example shown in drawing 1, the configuration near a convex curved surface is acquired by stepping on a phase more finely and performing etching disposal.

[0012] Drawing 2 is the key map showing an example which performs convex processing after etching. On the polishing disc (the shape of a disc is a \*\*\*\* configuration) of a processing machine, convex processing by machining rotates a polishing disc, where the piezo-electric matter plate 1 is stored in the attaching part of a processing machine. When an attaching part also rocks attaching part support simultaneously, and the piezo-electric matter plate 1 rocks an abradant and polishing disc top forward and backward (right and left), \*\*\*\* in alignment with the radii of the polishing disc performs convex processing.

[0013] [ a place which is greatly different from the processing procedure of the piezo-electric matter plate 1 by this invention as mentioned above as shown in drawing 3 ]

Perform an etching step before convex processing and actually (1) After deleting the corner of the piezo-electric matter plate 1 for the piezo-electric matter plate 1 in each piezo-electric matter plate 1 unit which carries out outside finishing by (2) heavy etching, (3) Shorten the time which adds the process which processes convex processing by (4) etching beforehand to the piezo-electric matter plate 1, and it takes at the convex processing of the piezo-electric matter plate 1 itself at machining by convex processing. In addition, including AT cut plate crystal oscillator, SC cut plate crystal oscillator etc. is the piezo-electric matter plate 1 of a typical cut angle type, and there is no piezoelectric vibrator applied to this invention what receives constraint in the cut angle type. Moreover, if etching processing can be performed with other piezo-electric matter plate ingredients, the processing method of the invention in this application can be used.

[0014]

[Effect of the Invention] This invention can realize abbreviation of convex floor to floor time to the miniaturization of a piezo-electric matter plate, and the quality of the trembler itself can be maintained by improvement in processing accuracy. Moreover, the improvement in the yield and the quality control in a manufacturing process can be strengthened.

[Translation done.]

[Report Mistranslation](#)

[Japanese \(whole document in PDF\)](#)